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ASSOCIATION OF BLACK-TAILED PRAIRIE DOG COLONIES WITH CATTLE POINT ATTRACTANTS IN THE NORTHERN GREAT PLAINS

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ABSTRACT.—In October 1991 we recorded all black-tailed prairie dog (*Cynomys ludovicianus*) colonies and cattle point attractants in a 1248-km² study area in southwest North Dakota and southeast Montana. Cattle point attractants were defined as fabricated water tanks and long-term supplemental feed sites. We found that a significant number of prairie dog colonies encompassed or adjoined cattle point attractants ($p < .001$). Prairie dog colonies associated with cattle point attractants were a mean distance of 1.0 km from the next nearest town. The existence of cattle point attractants may encourage prairie dog colonization. Conversely, refraining from using long-term cattle point attractants may discourage prairie dog colonization.

Key words: prairie dogs, cattle, dispersal, management, Cynomys ludovicianus, *trampling*

Forage relationships between black-tailed prairie dogs (*Cynomys ludovicianus*) and cattle have been described in the literature (Hansen and Gold 1977, Uresk and Bjugstad 1983, Uresk 1985, Knowles 1986). However, a lesser number of authors have discussed how cattle activity can affect the creation and distribution of prairie dog colonies. Uresk et al. (1982) reported that black-tailed prairie dogs were more abundant in areas of southwest South Dakota that were heavily grazed by cattle. Koford (1958) stated that black-tailed prairie dogs inhabit areas where vegetation height was reduced by clipping plants to ground level.

Conversely, other authors demonstrated that increased vegetation height inhibits increases in prairie dog numbers. Snell and Hlavachick (1980) and Snell (1985) reported that prairie dogs suffered reduced expansion and elimination due to summer-deferred grazing. Cincotta et al. (1987) reported that prairie dog expansion can be inhibited by management for grasses of increased height and density.

We observed what appeared to be a disproportionate number of prairie dog colonies encompassing or adjoining cattle watering tanks and cattle supplemental feed sites. This phenomenon has been observed by other researchers (Koford 1958, Cincotta 1985, Daniel Uresk, USDA Forest Service, Rapid City, South Dakota, personal communication) but not statistically documented. The primary objective of this study was to document the correlation between the occurrence of cattle point attractants (i.e., water tanks and supplemental feed sites) and prairie dog colonies. In addition, we would analyze the spatial distribution of cattle point attractants and prairie dog colonies within the study area.

STUDY AREA AND METHODS

The 1248-km² study area (38.4 km north-south by 32.0 km east-west) is in Bowman and Slope counties in southwest North Dakota and Fallon County in southeast Montana. The southeast corner of the study area is located 4.8 km south of the town of Rhame, North Dakota (Fig. 1).

Mean annual precipitation is 40.3 cm, and mean annual snowfall is 100.3 cm. Mean temperatures range from −11°C in January to 21°C in July. The mean growing season is 122 days.

The study area is located in the Missouri Plateau physiographic region, with the major portion within a physiographic subdivision known as the Badlands (Omodt et al. 1968). This area is characterized by a highly eroded landscape and clay soils. Grassy plains and plateaus are interspersed between rugged buttes. Intermittent drainages form an exten-

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sive network throughout this physiographic area. The remainder of the study area is within a Missouri Plateau subdivision known as the unglaciated area (Omodt et al. 1968). It is characterized by gently rolling topography more typical of the Great Plains.

Vegetation is typical of mixed-grass and short-grass prairies. Grasses include western wheatgrass (*Agropyron smithii*), green needlegrass (*Stipa viridula*), blue grama (*Bouteloua gracilis*), and needle-and-thread (*Stipa comata*). Grasslands comprise about 50% of the study area. A shrub/grass mixture including sagebrush (*Artemisia* sp.), western snowberry (*Symphoricarpos occidentalis*), and chokecherry (*Prunus virginiana*) constitutes about 30% of the landscape. Green ash (*Fraxinus campestris*) and Rocky Mountain juniper (*Juniperus scopulorum*) are found in woody draws and on north-facing slopes, comprising an additional 10% of the study area. The remainder of the study area consists of barren areas.

Approximately 24% of the study area occurs on public land, most of which is administered by the U.S. Forest Service. The public land is intermixed with private holdings. Cattle grazing occurs throughout the study area. Grazing systems vary from season long to deferred or rest-rotation systems. Stocking rates range from 0.9 to 1.2 ha per animal unit month.

The U.S. Forest Service controls prairie dogs on public land when prairie dog colonies expand onto private holdings or exceed their allotted acreage for primary range within the management district. Primary range is defined by the U.S. Forest Service as "range which livestock naturally prefer, or will use first." Most landowners zealously attempt to control prairie dogs on their land, the most common method being the use of zinc phosphide–treated grain.

On 8 October 1991 we conducted an aerial census of the study area with 3.2-km-wide transects from an altitude of 305 m. Two observers recorded all prairie dog colonies and active cattle point attractants on their respective side of the plane. Prior and subsequent field surveys indicated the aerial census recorded all but two prairie dog colonies and all cattle point attractants.

Active cattle point attractants were easily identified from the air by the network of trails leading to the point attractant and the fringe of barren ground surrounding it. Cattle point attractants were water tanks or supplemental feed sites. For purposes of this study, water tanks are defined as fabricated structures, usually made of metal, concrete, or fiberglass. Only supplemental feed sites that had evidence of a long-term pattern of use by cattle were included in the analysis.

For our study, stock dams and dugouts were not considered cattle point attractants. Because of their greater surface area, stock dams and dugouts do not concentrate cattle to the degree that water tanks and supplemental feed structures do. In addition, the soil adjacent to stock dams and dugouts is often characterized by a high water table and strong clay content. These characteristics can discourage the creation of prairie dog burrows.

Size of the prairie dog colonies was determined by field surveys using mechanical measuring wheels and topographic maps. Distances between prairie dog colonies were measured with topographic maps.

A chi-square goodness-of-fit analysis was conducted on the number of cattle point attractants observed in or adjoining prairie dog colonies versus the number expected. A Mann-Whitney (Mann and Whitney 1947) test was used to compare the size of prairie dog colonies with associated cattle point attractants versus colonies without associated cattle point attractants.

RESULTS

Fifty-one prairie dog colonies were identified within the study area, ranging in size from 0.1 to 112.0 ha ($\bar{X}$ = 15.4 ha). Total prairie dog acreage on the study area was 784.5 ha, or approximately 0.6% of the study area. Prairie dog colonies were distributed throughout the study area with the exception of the extreme northwest corner (Fig. 1).

One hundred four active cattle point attractants were identified in the study area. A density of 1 cattle point attractant per 12.0 km^2 was observed in the 1248-km^2 study area. Fourteen cattle point attractants were within or adjoining prairie dog colonies.

A chi-square goodness-of-fit test of the number of cattle point attractants in or adjoining prairie dog towns (n = 14) versus the number expected (prairie dog acreage / study

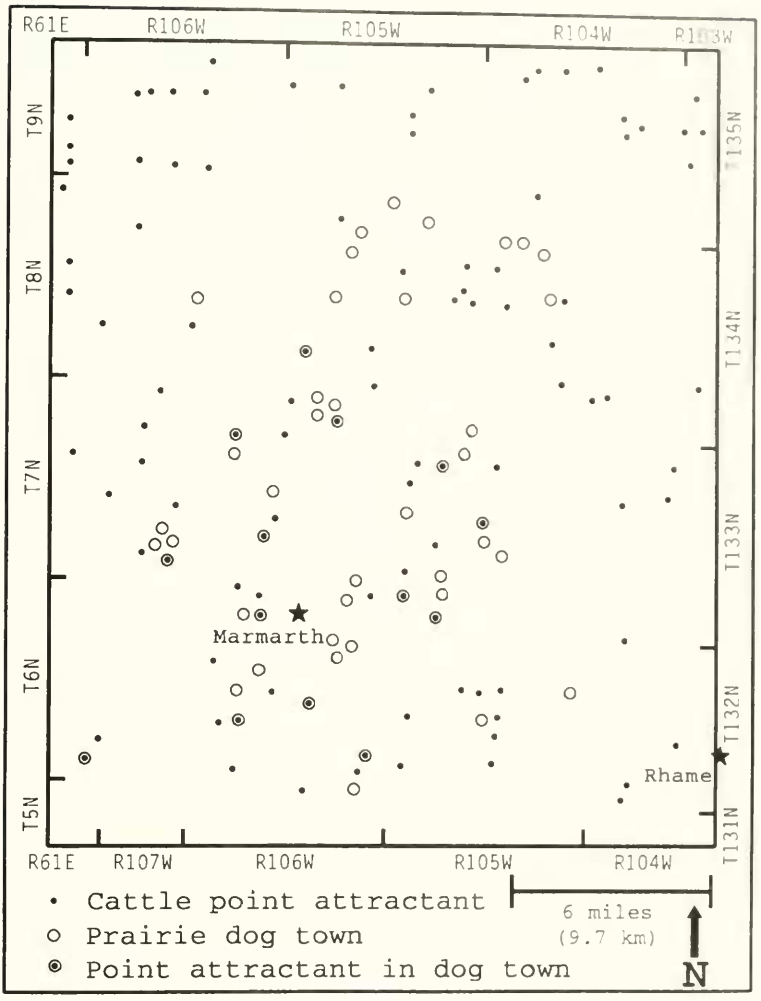

Fig. 1. Distribution of cattle point attractants and prairie dog colonies in the study area. Symbols do not represent the actual scale of the cattle point attractants or the prairie dog colonies.

area acreage × number of point attractants = 0.65) revealed that prairie dog colonies were significantly more likely to be associated with cattle point attractants than expected (X^2 = 272.4, 1 df, $p < .001$). When only prairie dog colonies <5 ha were analyzed, the number of cattle point attractants in or adjoining prairie dog colonies ($n = 7$) versus the number expected ($n = .04$) had a higher X^2 value (X^2 = 1181.6, 1 df, $p < .001$). A Mann-Whitney test revealed no statistically significant difference in size between prairie dog colonies with associated cattle point attractants versus colonies without ($U = 270.0$, $n_{37,14}$, $p = .184$).

The mean distance of prairie dog colonies with associated cattle point attractants to the next nearest prairie dog town was 1.0 km (n = 13, range = .1–2.6 km). One town was excluded from analysis because it was on the perimeter of the study area. Prairie dogs that originally established the town may have come from unknown colonies outside the study area.

DISCUSSION

Prairie dog dispersal is an evolutionary adaptation with a variety of purposes, including colonization of new areas. Garrett (1982) tracked one dispersing prairie dog 7 km before it settled at the edge of an existing prairie dog town.

Prairie dogs in our study area appeared to have dispersed a minimum mean distance of 1.0 km before establishing new colonies encompassing or adjoining cattle point attractants. It is possible that some animals may have immigrated from abandoned colonies or colonies unknown to us, thereby lessening the actual dispersal distance. However, we found no evidence of such occurrence. The actual mean distance dispersed may be greater than reported since prairie dogs may not have immigrated from the next nearest town in all cases.

Our data showed a significant correlation between the presence of cattle point attractants and the occurrence of adjoining or encompassing prairie dog colonies. We cannot prove that cattle point attractants were established first and thus caused the subsequent colonization by prairie dogs. However, based on our field observations and a review of the literature, we feel strongly that this was the case in most instances.

Cattle point attractants are characterized by grazed and trampled vegetation and, therefore, high visibility for prairie dogs. Cincotta (1985) reported that dispersing prairie dogs immigrated into areas in existing prairie dog colonies that had low vegetation and, therefore, high visibility for prairie dogs. Koford (1958) reported that a small prairie dog town was initiated near bare ground that surrounded a mesquite tree. The tree was a favorite rubbing post for bison (*Bison bison*). Our results are consistent with his theory of prairie dogs moving into areas with high visibility. We found a significant correlation between the presence of cattle point attractants and prairie dog towns, although we cannot state for certain the cause-and-effect relationships.

Koford (1958) speculated that fabricated water tanks may also attract prairie dogs because of higher forage production in the area adjoining the tank. Water that overflows the rim of the tank may stimulate a significant increase in forage production in certain situations. However, in none of the water tanks we observed did overflow water quickly drained away from the area through small ditches. We believe that trampled ground is a much more significant influence in the selection process by prairie dogs.

It is well known that areas with low vegetation and high visibility are conducive to prairie dog colonization (Koford 1958, Uresk et al. 1982, Cincotta 1985). We believe that cattle point attractants can create a microenvironment with these characteristics and facilitate prairie dog expansion. The creation of cattle point attractants in close proximity to prairie dog colonies (0.1–2.6 km) may promote the establishment of new colonies. Conversely, we believe that the establishment of new prairie dog colonies can be suppressed by refraining from using cattle point attractants. Moving cattle point attractants before a condition of low vegetation develops may also discourage prairie dog expansion.

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